MATH 756: Complex Variables II
Spring 2022 Course Syllabus

NJIT Academic Integrity Code: All Students should be aware that the Department of Mathematical Sciences takes the University Code on Academic Integrity at NJIT very seriously and enforces it strictly. This means that there must not be any forms of plagiarism, i.e., copying of homework, class projects, or lab assignments, or any form of cheating in quizzes and exams. Under the University Code on Academic Integrity, students are obligated to report any such activities to the Instructor.

Please be sure you read and fully understand our DMS Online Exam Policy.

COURSE INFORMATION

Course Description: A deeper investigation of the theory and applications of complex analysis in several topic areas. The areas chosen for study are to be selected by the instructor from topics such as conformal mapping – including a proof of the Riemann mapping theorem, Picard's theorems, elliptic integrals, asymptotic evaluation of integrals, Riemann–Hilbert problems and complex dynamical systems.

Number of Credits: 3

Prerequisites: Math 656 or departmental approval.

Course-Section and Instructors:

Course-Section	Instructor
Math 756-002	Professor D. Blackmore

Office Hours for All Math Instructors: Spring 2022 Office Hours and Emails

Required Textbook:

Title	*Complex Variables + Notes*
Author	Ablowitz & Fokas
Edition	2nd
Publisher	Cambridge University Press
ISBN #	978-0521534291

University-wide Withdrawal Date: The last day to withdraw with a **W** is **Monday, April 4, 2022**. It will be strictly enforced.

COURSE GOALS

Course Objectives

- Gain deep understanding of the wide-ranging properties of analytic functions of a complex variable.
- Learn key theorems applicable to analytic functions, in particular theorems concerning conformal maps and various special types of integrals.
- Learn key applications of more advanced theorems, such as those concerning asymptotic expansions of certain definite integrals.
- Learn how to apply more advanced knowledge of analytic functions to problems in fluid flow, electrostatics and other areas.

Course Outcomes

- Students gain deeper knowledge of the theory of a function of complex variable. Students are prepared for further study in more advanced applied mathematics courses.
- Students are better prepared for the Complex Analysis part of the Ph.D. Qualifying Examination at NJIT and other Ph.D.-granting Universities and for future research.
- Students can apply the theory of analytic functions to solve problems in applied mathematics, fluid dynamics, electrodynamics and other fields.

Course Assessment: The assessment of objectives is achieved through homework assignments, and the in-class midterm and final examinations.

POLICIES

DMS Course Policies: All DMS students must familiarize themselves with, and adhere to, the Department of Mathematical Sciences Course Policies, in addition to official university-wide policies. DMS takes these policies very seriously and enforces them strictly.

Grading Policy: The final grade in this course will be determined as follows:

Homework	15%
Midterm Exam	35%
Final Exam	50%

Your final letter grade will be based on the following tentative curve.

A	88 - 100	**C**	62 - 67
B+	82 - 87	**D**	55 - 61
B	75 - 81	**F**	0 - 54
C+	68 - 74		

Attendance Policy: Attendance at all classes will be recorded and is **mandatory**. Please make sure you read and fully understand the Math Department's Attendance Policy.

Exams: There will be three exams during the semester and a cumulative final exam during the final exam week:

Midterm Exam	March 9, 2022
Final Exam Period	May 6 - May 12, 2022

The final exam will test your knowledge of all the course material taught in the entire course. Make sure you read and fully understand the Math Department's Examination Policy. This policy will be strictly enforced.

Makeup Exam Policy: There will be **NO MAKE-UP QUIZZES OR EXAMS** during the semester. In the event an exam is not taken under rare circumstances where the student has a legitimate reason for missing the exam, the student should contact the Dean of Students office and present written verifiable proof of the reason for missing the exam, e.g., a doctor's note, police report, court notice, etc. clearly stating the date AND time of the mitigating problem. The student must also notify the Math Department Office/Instructor that the exam will be missed.

Cellular Phones: All cellular phones and other electronic devices must be switched off during all class times.

ADDITIONAL RESOURCES

Further Assistance: For further questions, students should contact their instructor. All instructors have regular office hours during the week. These office hours are listed on the Math Department's webpage for Instructor Office Hours and Emails.

Accommodation of Disabilities: The Office of Accessibility Resources and Services (OARS) offers long term and temporary accommodations for undergraduate, graduate and visiting students at NJIT.

If you are in need of accommodations due to a disability please contact Scott Janz, Associate Director of Disability Support Services at 973-596-5417 or via email at scott.p.janz@njit.edu. The office is located in Kupfrian Hall, Room 201. A Letter of Accommodation Eligibility from the Office of Accessibility Resources and Services office authorizing your accommodations will be required.

For further information regarding self identification, the submission of medical documentation and additional support services provided please visit the Office of Accessibility Resources and Services (OARS) website at:

https://www.njit.edu/studentsuccess/accessibility/

Important Dates (See: Spring 2022 Academic Calendar, Registrar)

Date	Day	Event
January 18, 2022	Tuesday	First Day of Classes
January 22, 2022	Saturday	Saturday Classes Begin
January 24, 2022	Monday	Last Day to Add/Drop Classes
March 14, 2022	Monday	Spring Recess Begins
March 19, 2022	Saturday	Spring Recess Ends
April 4, 2022	Monday	Last Day to Withdraw

April 15, 2022	Friday	Good Friday - No Classes
April 17, 2022	Sunday	Easter Sunday - No Classes
May 3, 2022	Tuesday	Friday Classes Meet
May 3, 2022	Tuesday	Last Day of Classes
May 4 - May 5, 2022	Wednesday and Thursday	Reading Days
May 6 - May 12, 2022	Friday to Thursday	Final Exam Period

Course Outline

Date	Sections	Topics	Assignment
1/19	5.1, 5.2	Conformal Maps	Selected Probs.
1/24	5.3	Conformal Maps and Inverses	Selected Probs.
1/26	Notes	Introduction to Riemann Mapping Theorem (RMT)	Selected Probs.
1/31	Notes	Normal Families, Montel's Theorem	Selected Probs.
2/2	Notes	Proof of the RMT	Selected Probs.
2/7	Notes	Continuity at Boundary	Selected Probs.
2/9	Notes	Applications: Elliptic Functions & Picard's Theorems	Selected Probs.
2/14	Notes	Elliptic functions & Picard's Theorems	Selected Probs.
2/16	6.1	Asymptotic Integration: Fundamentals	Selected Probs.
2/21	6.2	Laplace Type Integrals: Watson's Lemma; Laplace's Method	Selected Probs.
2/23	6.3	Fourier Type Integrals: Watson Analog; Stationary Phase	Selected Probs.
2/28	6.4	Steepest Descent	Selected Probs.
3/2	6.5	Applications	Selected Probs.
3/7	-------	Review for Midterm Exam	----------
3/9	-------	**MIDTERM EXAM**	----------
3/14 - 3/19	**-------**	**SPRING BREAK**	**----------**
3/21	6.7	WKB Method	Selected Probs.
3/23	7.1	Riemann—Hilbert Problems	Selected Probs.
3/28	7.2	Riemann—Hilbert Problems: Cauchy Type Integrals	Selected Probs.
3/30	7.3	Scalar Riemann—Hilbert Problems	Selected Probs.
4/4	7.4	Applications of Scalar Riemann—Hilbert Problems	Selected Probs.
4/6	7.4, 7.5	Applications of Scalar Problems, Matrix Problems	Selected Probs.
4/11	7.5	Matrix Riemann—Hilbert Problems	Selected Probs.
4/13	Notes	Complex Dynamical Systems	Selected Probs.

4/18	Notes	Complex Dynamical Systems	Selected Probs.
4/20	Notes	Complex Dynamical Systems	Selected Probs.
4/25	Notes	Complex Dynamical Systems	Selected Probs.
4/27	Notes	Complex Dynamical Systems	Selected Probs.
5/2	-------	**REVIEW FOR FINAL EXAM**	----------

Updated by Professor D. Blackmore - 1/13/2022
Department of Mathematical Sciences Course Syllabus, Spring 2022